CC006

Renewable and Low Carbon Energy Study 2021

FAREHAM
BOROUGH COUNCIL

Contents

1. Introduction

1.1 This study seeks to provide an evidence base on the potential for some renewable and low carbon energy technologies within the Borough of Fareham. This can be used by applicants for further investigation into the development of renewable and low carbon production in Fareham as well as supporting the policies within the Council's emerging Local Plan.

1.2 It aims to update the existing Renewable Energy Capacity Study produced in 2013, taking into account more recent modifications in national policy and current and future land use changes. It presents a current national and local picture of renewable and low carbon energy production and installation based on best available data.

The Key Study Objectives are to:

- Update the current installed capacity of renewable and low carbon energy in and around the Borough, where possible.
- Identify the technical and deployable potential for renewable and low carbon energy within the Borough, where possible.
- Identify and map the key opportunity areas for particular types renewable and low carbon development in the Borough (Solar and Wind).
- Provide guidance and recommendations to inform the development of renewable and low carbon technology in Fareham and help to support the policies in the Council's emerging Local Plan.

1.3 The need for the study arose from three key drivers;

- The need to facilitate contributions towards the Government targets to reduce carbon emissions and promote increases in renewable energy generation in line with legislation.
- To ensure the Borough's key policy documents and strategies align with the requirements of the revised National Planning Policy Framework (2019)
- The need for the Council to have an up-to-date evidence base to inform the preparation of the emerging Local Plan 2037.

1.4 A summary of the main renewable and low carbon energy technologies that are covered by this study is shown below;

- Solar (of differing scales);
- Wind (on-shore)
- Hydro;
- Tidal;
- Biomass and Anaerobic Digestion.
- Combined Heat and Power/District Heating;

1.5 Whilst it is recognised that smaller residential forms of renewable and low carbon energy form an important component of reducing greenhouse gases and tackling climate change, the focus of this study is on larger more commercial scale developments. The study therefore focuses primarily on larger scale renewable electricity and heat technologies which are deemed appropriate for the Borough, including both commercial scale renewables and on-site microgeneration.

1.6 A comprehensive assessment of the technological and deployable potential for the range of renewable and low-carbon technologies is presented in this study by comparing the specific requirements of each type of renewable and low carbon technology along with an assessment of the potential environmental and socio/economic constraints. Based on these results, opportunity areas for the most viable and achievable renewable and low carbon development in the Borough are then presented, where possible graphically. An explanation justifying why some technologies are considered not suitable and viable for the Borough is also presented.

1.7 This evidence supports the policy position within the emerging Local Plan 2037 which, takes into account the requirements of the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG).

2. Policy Context

Relationship with National Legislation

The Climate Change Act 2008

2.1 At the end of 2008, the Climate Change Act was passed, restating the UK Government's commitment to move towards a low carbon economy. The Act looks ahead to reductions in UK carbon dioxide emissions of 100% by 2050 and makes these legally binding on the Government.

2.2 The Act also establishes the Committee on Climate Change (CCC) which is required to report annually to Parliament on the progress made in reducing carbon emissions. The most recent 2018 report[1] suggest that UK emissions are down 43% compared to the 1990 baseline. This has largely been down to progress in reducing emissions from electricity generation whilst emission reductions in other sectors have plateaued. The report refers to the uneven balance of emissions reductions and states that at present, the UK is not on track to meet the fourth and fifth legally binding carbon budgets. In order to meet future carbon budgets, the report delivers four key messages to the government to meet the emissions reduction targets. These are:

- Support the simple, low cost, low risk options
- Commit to effective regulation and strict enforcement
- End the chopping and changing of policy
- Act now to keep long term options open

Ministerial Statement on Onshore Wind

2.3 On the 18th June 2015, the Secretary of State for Communities and Local Government (Greg Clark) released a Ministerial Statement on onshore wind energy. This stated that:

"When considering applications for wind energy development, local planning authorities should (subject to the transitional arrangement) only grant planning permission if: the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing.

Whether the proposal has the backing of the affected local community is a planning judgement for the local planning authority."

2.4 The Ministerial Statement was subsequently incorporated into the PPG (see Paragraph: 033 of the Renewable and Low Carbon Section) and as subsequently shown below, included into the revised NPPF.

[1] Committee on Climate Change. 2018. Reducing UK Emissions, 2018 Progress Report to Parliament. https://www.theccc.org.uk/wp-content/uploads/2018/06/CCC-2018-Progress-Report-to-Parliament.pdf

Relationship to National Policy

2.5 The NPPF is the basis upon which planning policy is formulated. The overarching objective of the NPPF is the promotion of sustainable development. In this context, it is recognised that the planning system has a vital role to play in helping to mitigate and adapt to climate change and support the transition to a low carbon future. Local Plans should take a proactive approach in this respect. Indeed, paragraph 148 of the NPPF explicitly states that planning should help support renewable and low carbon energy and associated infrastructure.

2.6 A specific section on 'Planning for Climate Change' within the NPPF sets out what is expected of local planning authorities when developing renewable energy policies:

151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.(paragraph 152).

2.7 When it comes to determining planning applications for renewable or low carbon energy, the NPPF is clear that there should not be a requirement for applicants to demonstrate the overall need for renewable or low carbon energy, recognising that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions (paragraph 154a). This is particularly in light of the expectation of planning system to help contribute towards the targets and objectives set out in the Climate Change Act 2008.

2.8 In addition, Local Planning Authorities should *"approve the application if its impacts are (or can be made) acceptable." (paragraph 154b).* The exception to this is for applications for the repowering of existing wind turbines and/or a proposed wind energy development involving one or more turbines. According to footnote 49 in the NPPF, *"These should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing".* This footnote has its basis in the Ministerial Statement produced by the Secretary of State for Communities and Local Government in 2015.

2.9 Paragraph 154b of the NPPF then goes on to state *"Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."*

Planning Practice Guidance

2.10 In terms of responsibility for handling renewable and low carbon energy developments, the Planning Practice Guidance (PPG) advises that local planning authorities are responsible for renewable and low carbon energy development of 50 megawatts or less installed capacity (under the Town and Country Planning Act 1990). Renewable and low carbon development over 50 megawatts capacity are considered by the Secretary of State for Energy under the Planning Act 2008, and the local planning authority is a statutory consultee.

2.11 When identifying areas suitable for renewable and low carbon energy, the PPG states that there are 'no hard and fast rules'. However, in considering locations, local planning authorities will need to ensure they take into account the requirements of the technology and, critically, the potential impacts on the local environment, including from cumulative impacts. The views of local communities likely to be affected should be listened to.

2.12 There is a methodology available from the Department for Business, Energy & Industrial Strategy website on assessing the capacity for renewable energy development which can be used in addition to utilising any existing local assessments; providing the evidence used to support the assessment is up to date.

2.13 The PPG provides particular planning considerations for several renewable and low carbon energy technologies which will be referred to later in the 'technology constraints' section of this study.

Partnership for South Hampshire Solent Energy Strategy (2015)

2.14 This study used data from 2008 to provide a baseline picture of renewable energy usage for the PUSH[2]/Solent authorities and then forecasted the overall renewable energy capacity technically available in the area if all the available renewable resources were used. The study estimated the potential electricity generation from renewable sources to be around 4,943 - 6,189 MW whilst heat energy potential was approximately 2,244 - 2,386MW.

2.15 The study identified the largest generation capacity is from on-shore wind providing 2342 MW by 2020. However, given the ministerial statement in 2015 and NPPF (2019) policy regarding wind energy, this large potential source of renewable energy will be difficult to exploit.

Relationship with Local Policy

2.16 Future renewable energy development in Fareham will be shaped by the availability of resources and suitable development sites as wells as the economic viability of such proposals. This should be carefully balanced against the need to protect the environment including biodiversity from any adverse effects. The Local Plan 2037 presents an opportunity to identify areas suitable for certain types of renewable energy development such as solar and wind power.

Fareham currently has 3 adopted Local Plans in Place. Local Plans Part 1 and 2 are to be replaced by the emerging Fareham Local Plan 2037. Local Plan part 3 Welborne Plan is to remain.

- Local Plan Part 1: Core Strategy (adopted 2011)
- Local Plan Part 2: Development Sites and Policies Plan (adopted 2015
- Local Plan Part 3: Welborne Plan (adopted 2015)

Fareham Local Plan 2037.

2.17 This study provides evidence and recommendations to help inform the development of planning policy in the emerging Local Plan 2037 relating to renewable and low carbon energy for Fareham.

The proposed policy within the Local Plan 2037 is shown below

[2] Now renamed as Partnership for South Hampshire PfSH.

Policy CC4: Renewable and Low Carbon Energy

Proposals for the delivery of renewable and low carbon energy (excluding wind turbines proposals) and the associated infrastructure will be supported provided that there are no adverse impacts on:

a) *The character and sensitivity of the surrounding landscape and designated landscape features; and*
b) *Designated and undesignated heritage assets; and*
c) *Ecology, including designated biodiversity and geodiversity sites, priority habitat and species and ancient woodland (including veteran trees) and the flight paths of birds and bats (where appropriate); and*
d) *Water quality and water resources (including groundwater)*
e) *The surroundings (including air quality, shadow flicker, waste, odour and noise) of local residents and businesses; and*
f) *Traffic arising from the construction, decommissioning and maintenance of the infrastructure and/or, where appropriate, the transportation of fuel.*

Proposals for renewable and low carbon energy requiring mitigation for any identified adverse impacts will need to be accompanied by a fully costed management and maintenance plan for the lifetime of the development.

Proposals will only be supported where the benefit of the development clearly outweighs the harm caused by the development.

All proposals should, where possible, be resilient and ensure they are safe from future impacts as a result of climate change by avoiding areas of flood risk both now and in the future.

Proposals for solar energy development should have due regard to the areas identified as being least constrained, shown within the Renewable and Low Carbon Energy Study. Proposals outside of these areas will be required to provide suitable justification to demonstrate their suitability.

Proposals shall demonstrate that the site will be reinstated to an acceptable use appropriate for the area should the development cease to be operational.

3. Installed Capacity

National Picture

3.1 The Department for Business Energy & Industrial Strategy's UK Statistics show that in the second quarter of 2018, renewable energy capacity nationally was 42.2 Gigawatts (GW). This represents a 10% increase from the previous year and a 1.4% increase on the previous quarter[3]. Nationally, the largest generation of renewable energy came from onshore wind at 13,170GW with solar photovoltaics producing 13,012GW. The statistics show that in addition to onshore wind and solar photovoltaics, offshore wind, large scale hydro, landfill gas, energy from waste and plant biomass are the other main sources of renewable energy production in the UK. Anaerobic digestion, animal biomass, small scale hydro and shoreline wave/tidal are the least used technology nationally.

Feed-in Tariff- Small to Medium Scale Renewable Power

3.2 The Department for Business, Energy & Industrial Strategy and Ofgem publishes statistics and data on the numbers of renewable energy installations registered for the Feed-in Tariff (FiT) at a sub-regional level. The Feed-in Tariff is a government programme designed to promote the uptake of renewable, low carbon energy generation. It provides payments to those who generate their own renewable/low carbon energy (generation Tariff) as well as providing the ability for generators to sell any extra units that they do not use back to their electricity supplier (export tariff). It has been in operation since 2010 and was available for anyone who has installed, or is looking to install, one of the following technology types up to a capacity of 5MW, or 2kW for CHP:

- Solar photovoltaic (solar PV)
- Wind
- Micro combined heat and power (CHP)
- Hydro
- Anaerobic digestion (AD)

3.3 However, on 19 July 2018 the Department of Business Energy and Industrial Strategy (BEIS) published a consultation in which they state their intention to close the FIT scheme to new applicants from 1 April 2019. The results of this consultation has resulted in the Government deciding to close the Feed in Tariff scheme to new applications from March 31st 2019. Therefore calculations of household renewable energy installation will have to use a different data source in future studies.

3.4 Data accurate as of 1st October 2018 for Fareham, indicate that there is no wind, hydro or anaerobic digestion plants registered under the FiT in Fareham. Of the estimated 49,494 households in Fareham[4] 1,771 have registered solar panel installation whilst there are an additional 33 registered non-domestic installations. There are also two registered Micro

[3] National Renewable Energy Statistics. 2018 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/743591/Renewables.pdf

[4] England: Department for Communities and Local Government, 2018 Household Projections; Table 406

CHP installations in Fareham. Table 1 below indicates the capacity associated with these installations in Megawatts electric (MW_e).

Table 1. Feed-in Tariff installation in Fareham up to 2019

	Domestic		Non Domestic (Commercial and Industrial)		Community		Total	
Technology	No	Capacity (MW_e)	No	Capacity (MW_e)	No	Capacity (MW_e)	No	Capacity (MW_e)
Micro CHP	2	0.002	0	0.000	0	0.000	2	0.002
Photovoltaic	1771	5.876	36	0.768	3	0.009	1810	6.653
Wind	0	0.000	0	0.000	0	0.000	0	0.000
Hydro	0	0.000	0	0.000	0	0.000	0	0.000
Anaerobic Digestion	0	0.000	0	0.000	0	0.000	0	0.000
Total Installed Capacity (MW_e)	**5.878**		**0.768**		**0.009**		**6.655**	
Total Installations	**1773**		**36**		**3**		**1812**[5]	

Other Small and Medium Scale Renewable Power (Renewable Heat Incentive)

3.5 Ofgem produce annual reports on the number of accredited domestic[6] and non-domestic[7] Renewable Heat Incentive (RHI) installations. These however, are only produced at the regional and national level. For domestic RHI, the headline figure for the South-east region is, a total of 875 RHI accredited schemes were installed from the period April 2017 to March 2018. For non-domestic RHI, there are 18,269 installed accreditations in England from the period April 2017 to March 2018.There was no data at a high enough resolution to state whether any of these are located in Fareham.

3.6 Renewable Heat Incentive encompasses technology such as air source heat pumps, ground source heat pumps, solar thermal, solid biomass, biofuel and biogas.

Larger Scale Renewable Power

3.7 Larger schemes (over 5MWe) are not eligible for the Feed-in Tariff. A search of the Renewable Energy Planning Database (REPD)[8] found that there is one large scale renewable energy installation in the Borough. The Solar Photovoltaic installation situated between HMS Collingwood and Peel Common Waste Water Treatment Works and just west of the old Newgate Lane has been operational since 2014. It has a total installed

[5] Ofgem Central FIT Register. Reports- FIT Summary- Accurate as of 01/10/2018

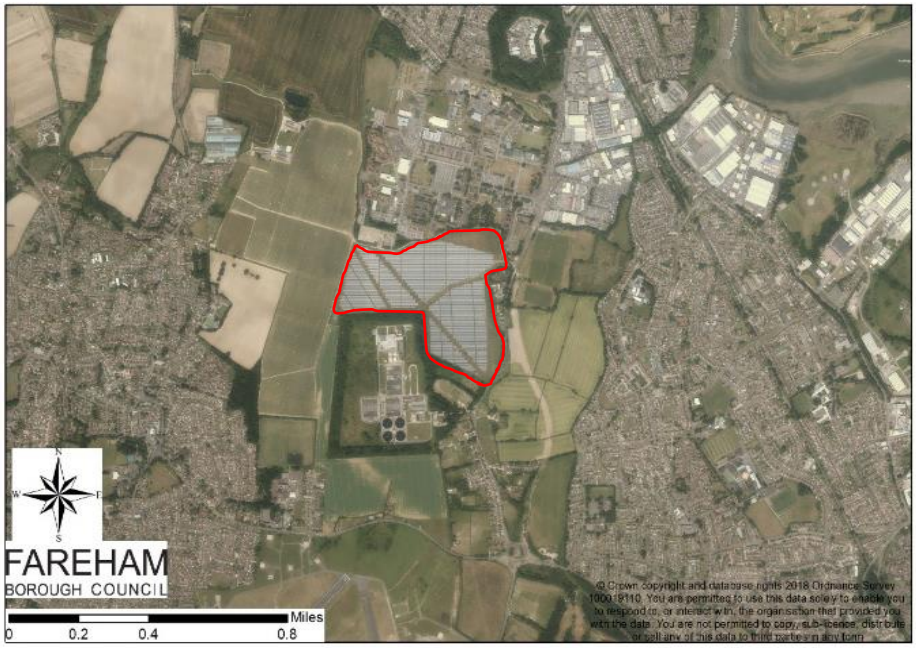
[6] https://www.ofgem.gov.uk/system/files/docs/2018/07/domestic_renewable_heat_incentive_annual_report_july_2018.pdf

[7] https://www.ofgem.gov.uk/system/files/docs/2018/07/non_domestic_renewable_heat_incentive_annual_report_final_20718.pdf

[8] Renewable Energy Planning Database (REPD) August 2018 https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract

capacity of 20.5MWe. There are no other large scale renewable energy installations in the Borough.

Figure 1: Newlands Solar Farm, Fareham.



3.8 A further search of the Renewable Energy Planning Database demonstrates that the South Hampshire region is a good area for renewable energy from Solar Photovoltaics. There are a further 9 Solar Photovoltaic installations in the PUSH region amounting to a combined total of 110.4 MWe of installed capacity.

Larger Combustion Plants

3.9 A search of the Environment Agency's Environmental Permits Register returned no industrial installation permits in the Borough.

3.10 The Government public database on Combined Heat and Power (CHP) [9] indicates there are no large CHP, district heating systems, waste to energy or thermal power station installations within the Borough. However, this data is collated from the Combined Heat and Power Quality Assurance Programme CHPQA accreditation scheme only provides details for sites which gave their permission to be published. Previous studies have identified a CHP installation at the Naval Shore Establishment HMS Collingwood however this no longer appears to be shown on the publicly available database.

3.11 Table 2 demonstrates that there are however 4 Combined Heat and Power installations within the PfSH area.

[9] Department for Business Energy & Industrial Strategy 2018 CHP database: https://chptools.decc.gov.uk/chp/public

Table 2 Combined Heat and Power facilities in the PfSH region

Site Name	Technology Type	Installed Capacity (MWe)
Portsmouth ERF	Municipal Solid Waste Incineration	14
Marchwood ERF	Municipal Solid Waste Incineration	16
Fawley Waste to Energy Plant	Municipal Solid Waste Incineration	8.6
Paulsgrove Landfill Site	Landfill Gas	2.4
Southleigh Landfill Site	Landfill Gas	3.5
Fairoak Landfill Site	Landfill Gas	1.5
Netley Landfill Site	Landfill Gas	1.2
University of Southampton	CHP	2.8
Southampton District Energy Scheme	CHP	7.4
QA Hospital Portsmouth	CHP	3.26
Places Leisure Centre	CHP	1.9

3.12 There are 3 large Municipal Waste Incineration combustion plants in operation within the PfSH Region whilst there are a further 4 much smaller Landfill Gas combustion plants operating. There appears to be no plants in operation within Fareham.

4. Resource

4.1 Some of the data used to predict resource availability in Fareham is in some instances, several years old. However, this is the only information publicly and freely available. Furthermore, some of the information available is presented at the sub-regional level (either PfSH or South East England). This should be recognised as one of the constraints of the study but also acknowledged that this information has to be used as the only data available in order to give an estimate of the resource potential for the Borough. As and when newer studies are commissioned and published, this study will need be updated to take any new findings into account.

Solar

4.2 Being on the south coast of England, Fareham offers good potential for Solar Photovoltaic development. This is because it receives a good amount of solar irradiation as a result of being closer to the equator than northern parts of the country. Solar irradiation can be measured using the Photovoltaic Geographical Information System (PVGIS) tool available online. Developed by the European Union's Science Hub, it provides free open web access to solar radiation and temperature data and to PV performance assessment tools for any location in Europe as well as in Africa and large parts of America and Asia[10].

4.3 PVGIS estimates that Fareham receives an average annual solar irradiation of 1,470 kWh/m^2. This amount in Fareham would be enough to produce approximately 1,210 kWh

[10] EU Science Hub Photovoltaic Geographical Information System 2017. http://re.jrc.ec.europa.eu/pvg_tools/en/tools.html

of Photovoltaic energy production from one free standing fixed position solar panel with the installed peak PV power at 1 Kilowatt-peak[11]. This is substantially more PV energy production compared with more northern areas of England for example, in Carlisle, England's most northerly city, where average annual irradiation of 1,120 kWh/m^2 would only produce 910 kWh of PV energy[12].

4.4 These estimates assume a completely open site and do not make allowances for the built environment, forestry and any other sources of shade as well as the mean weather conditions. However, even on a cloudy day modern solar panels will produce electricity.

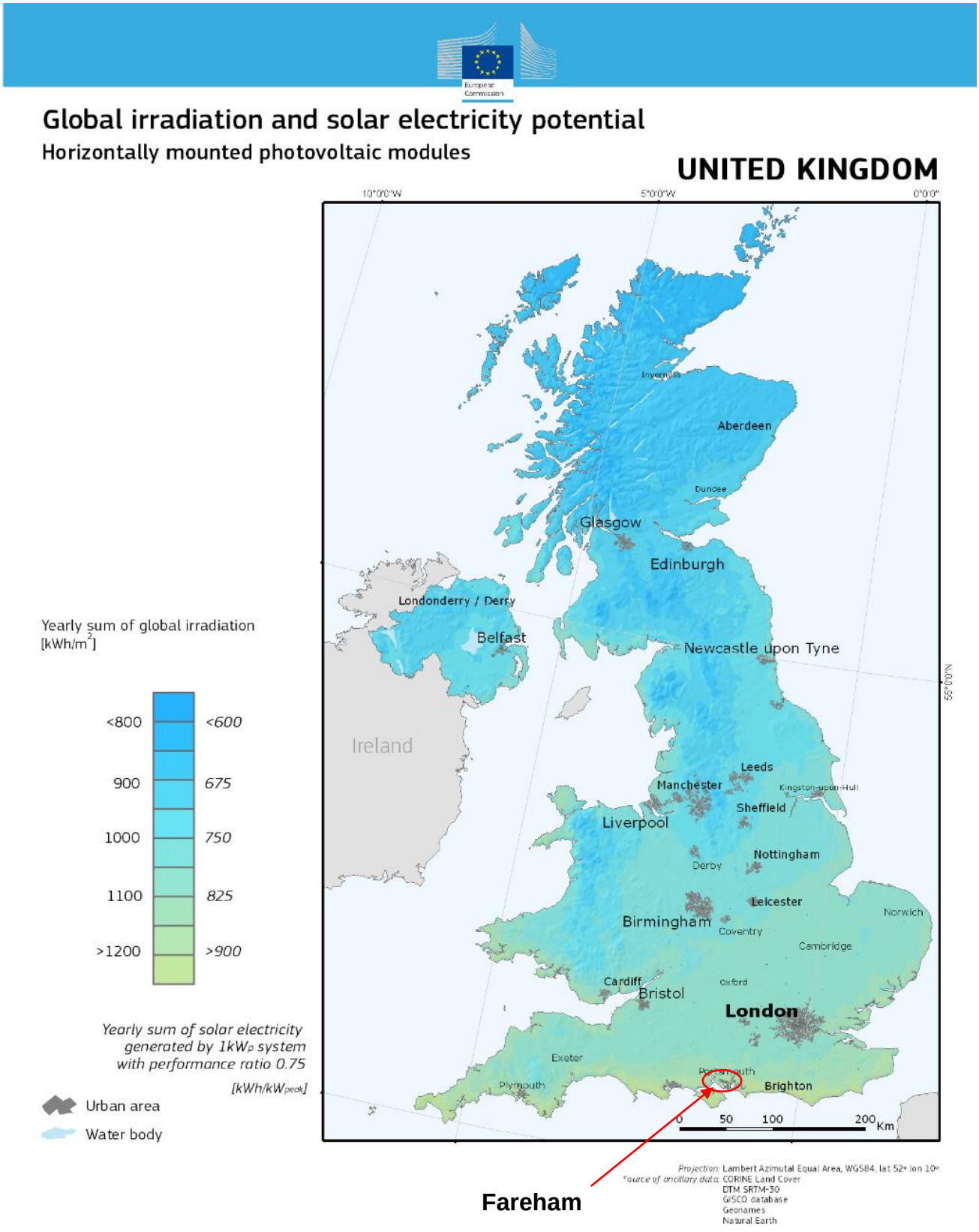
4.5 The threshold for solar energy resource regarded as sufficient for a solar farm development varies greatly. At present, there is very little guidance as to what is acceptable in the UK, since it is only one (admittedly significant) ingredient in a complex cost/benefit calculation. However a study by Palmer et al (2019) showed that of all the select solar farm sites assessed in the research, most were predicted to receive at least 1050 kWh/m2/annum solar irradiation[13]. The 1050 kWh/m2/annum solar irradiation is therefore used as a bench mark for viable large scale solar energy production. Because the PVGIS estimates that approximately 1,210 kWh of Photovoltaic energy could be produced in Fareham, this technology is considered a viable commercial resource from this point of view.

[11] Installed peak PV power is the power that the manufacturer declares that the PV array can produce under standard test conditions, which are a constant 1000W of solar irradiation per square meter in the plane of the array, at an array temperature of 25°C

[12] Source: EU Science Hub Photovoltaic Geographical Information System 2017. http://re.jrc.ec.europa.eu/pvg_tools/en/tools.html

[13] Palmer,D. Gottschlag, R, and Betts, T. 2019. The Future Scope of Large-scale Solar in the UK: Site Suitability and Target Analysis. *Renewable Energy. 133. 1136-1146.* https://reader.elsevier.com/reader/sd/pii/S0960148118310590?token=BE0247CA4BBF3FD4B0027780C1E7A820CCDE148C60AEE60675C62F2AC9AC7D2CF8F5FBB3729189776AFC0C3BC162097B

Figure 2 Solar Potential in the UK produced by the European Commission.



Wind

4.6 Southern England is according to the Meteorological Office, one of the more sheltered parts of the United Kingdom. The strongest winds are associated with the passage of deep areas of low pressure (depressions) that pass close to or across the UK. The frequency and strength of these depressions is greatest in the winter parts of the year, especially from December to February, and this is when mean speeds and gusts (short duration peak values) are strongest[14].

4.7 Fareham is situated on the south coast of the UK and as such will experience sea breezes from late spring through the summer, caused by the temperature differential between the sea and the warmer land. As a result, throughout the year there is often a continuous breeze providing a source of energy for wind turbine development.

4.8 The wind resource for Fareham has been assessed using the NOABL windspeed dataset. It provides a model of windspeeds across the Country. However, it is important to note that the model assumes completely flat terrain and does not take into account obstacles in the local environment. It is a high-level assessment which only provides indicative values as wind is not completely predictable varying from year to year. Whilst the NOABL database is no longer updated it can provide an approximate estimate of the windspeed potential for Fareham Borough.

4.9 The NOABL estimates average winds speeds at three differing heights 10m Above Ground Level (AGL) 25m AGL and 45m AGL. The table below gives the maximum and minimum annual average windspeeds in metre per second across the Borough by varying height[15] . whilst the map below shows the distribution of average windspeeds across the Borough at a height of 45m AGL.

Table 3 Windspeeds in Fareham Source NOABL

	Wind Speed at 10m AGL (m/s)	Wind Speed at 25m AGL (m/s)	Wind Speed at 45m AGL (m/s)
Maximum Average Recorded	5.7	6.5	6.9
Minimum Average Recorded	4.6	5.5	5.8

[14] https://www.metoffice.gov.uk/climate/uk/regional-climates/so#wind
[15] Source taken from http://www.renew-reuse-recycle.com/noabl.pl?go=Go&postcode=PO17+5DW&osx=&osy=&country=gb

Figure 3 Windspeeds (metres per second) across Fareham at 45m Above Ground Level [16]

4.10 The data suggests, notwithstanding environmental and other constraints, there is a reasonable opportunity for onshore wind energy development in the Borough (virtually all the Borough has windspeeds of 6 m/s and higher at 54m AGL). The highest wind speeds as expected are in Portchester upon the slopes of Portsdown Hill. Whereas the area of lowest windspeeds are in the more sheltered areas of the Borough like in Fareham East (to the north/north-east of Fareham Town). Reasons for this are the likely influence of the urban built form of Fareham Town, being further away from the coast.

4.11 Regarding off-shore wind development, the data on Fareham indicates that windspeeds in the area could be potentially viable for off-shore wind development. However, any development here would be out of the Council's jurisdiction as well the high volumes of commercial shipping and leisure navigation in the Solent makes off-shore wind very unlikely.

[16] Source: https://www.renewablesfirst.co.uk/windpower/windpower-feasibility-study/wind-site-self-assessment-wssa/

Hydropower

4.12 There are 3 main categories used to define the output from hydroelectric power:

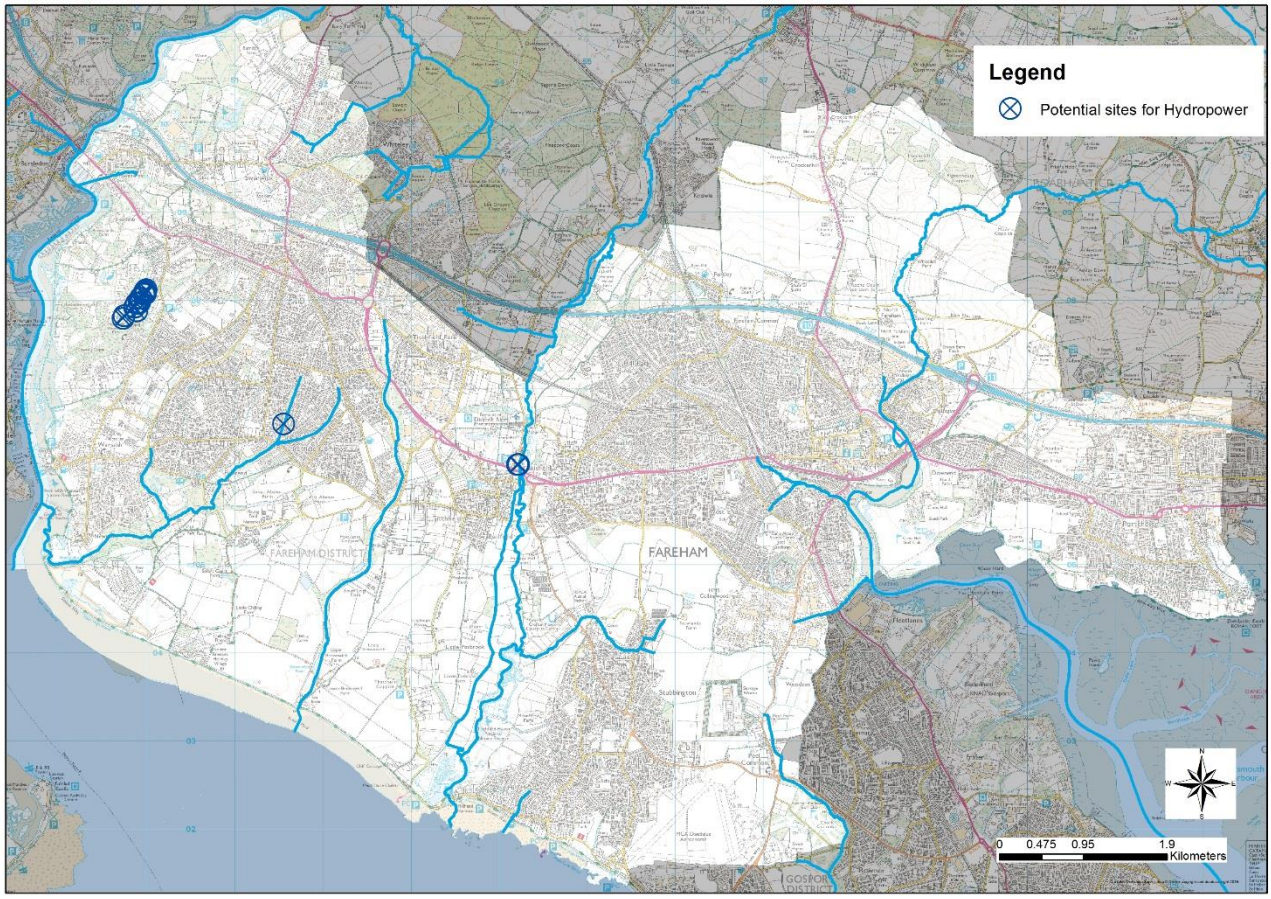
- Large-scale capacity: producing more than 5 megawatts (MW)
- Small-scale capacity: producing less than 5 megawatts
- Microscale capacity: producing less than 50 kilowatts

4.13 Opportunities to use this technology on a large scale are now limited, not only because of environmental concern but also because many of the most economically attractive sites for schemes have already been used. There are no known hydroelectric facilities currently operating in the Borough.

4.14 Below is a map showing the Potential Sites of Hydropower opportunity within Fareham's administrative boundary. This data was collected from the Environment Agency in 2019 and provides a high level assessment of the potential for small scale Run of River (RoR) hydropower schemes. As shown there are three areas in the Borough that have been identified as having potential for hydropower. The River Meon runs through the centre of the Borough and there are currently two sites categorised by the Environment Agency as having the potential to generate 10-15 kW of power. There is a small stream in the Locks Heath area that has the potential to generate 0.5 kW of power. The other location in the Borough is around the series of lakes within Holly Hill Local Nature Reserve which have the potential to generate between 0.01 and 0.1 kW of power.

4.15 Although upfront costs for hydropower are high, installations should last for decades. Low head installations can generate renewable energy 24 hours a day. However, there are several steps that have to be considered before a scheme can be built, e.g. scheme economics, environmental permits, planning consent and connection to the local electricity network. Impacts of any scheme on the ecology and hydrology of the water body that would need to be assessed and considered before any scheme could be permitted.

Figure 4: Potential sites for Hydropower identified by the Environment Agency



Biomass

4.16 This section provides an overview of the electricity and heat resource potential from the different forms of biomass, which can include anaerobic digestion. The most recently available data for biomass is at the sub-regional level and comes from the Future Solent and Partnership for South Hampshire Solent Energy Strategy 2015[17]. The term biomass in this instance covers solid biomass products such as: wood, organic/plant and agricultural/farming by-products such as animal poultry litter and agricultural arisings, or more liquid forms of biomass which includes: kitchen/food waste, sewage waste and wet organic waste from animal farming. These forms of biomass can be used to create biogas using a process known as anaerobic digestion.

4.17 The table below is an extract of data which shows the overall renewable energy capacity for biomass technically available in the sub-region. It presents an estimate of the amount of carbon dioxide (CO_2) that could be saved as well as the amount of energy which could be generated. However, it should be noted that there are likely to be regulatory, governance, financial and public opinion barriers to achieving this full potential.

[17] https://www.push.gov.uk/wp-content/uploads/2018/05/Solent-Energy-Strategy-2015.pdf

Table 4: Energy capacity for biomass PfSH Solent Energy Strategy 2015

Renewable Generation	Type of generation	Type of power produced	Capacity (MW)	$KtCO_2$ Saved
Biomass	Plant- Managed Woodland	Electricity	11.61	34.34
		Heat	193.69	82.11
	Plant- Energy Crop	Electricity	8.39-9.24	24.78
		Heat	109.06-120.22	46.24
	Plant- Waste Wood	Electricity	4.12-5.06	12.11
		Heat	61.94-69.18	26.29
	Plant- Agricultural Arisings	Electricity	52.26	154.98
	Animal- Poultry Litter	Electricity	2.02	4.12
	Animal- Wet Organic Waste	Electricity	557.28	1126.67
	Biomass co-firing	Electricity	73.43	102.53
Biogas	Landfill Gas	Electricity	1.68-5.1	10.18
	Sewage Gas	Electricity	7.74-83.05	11.43

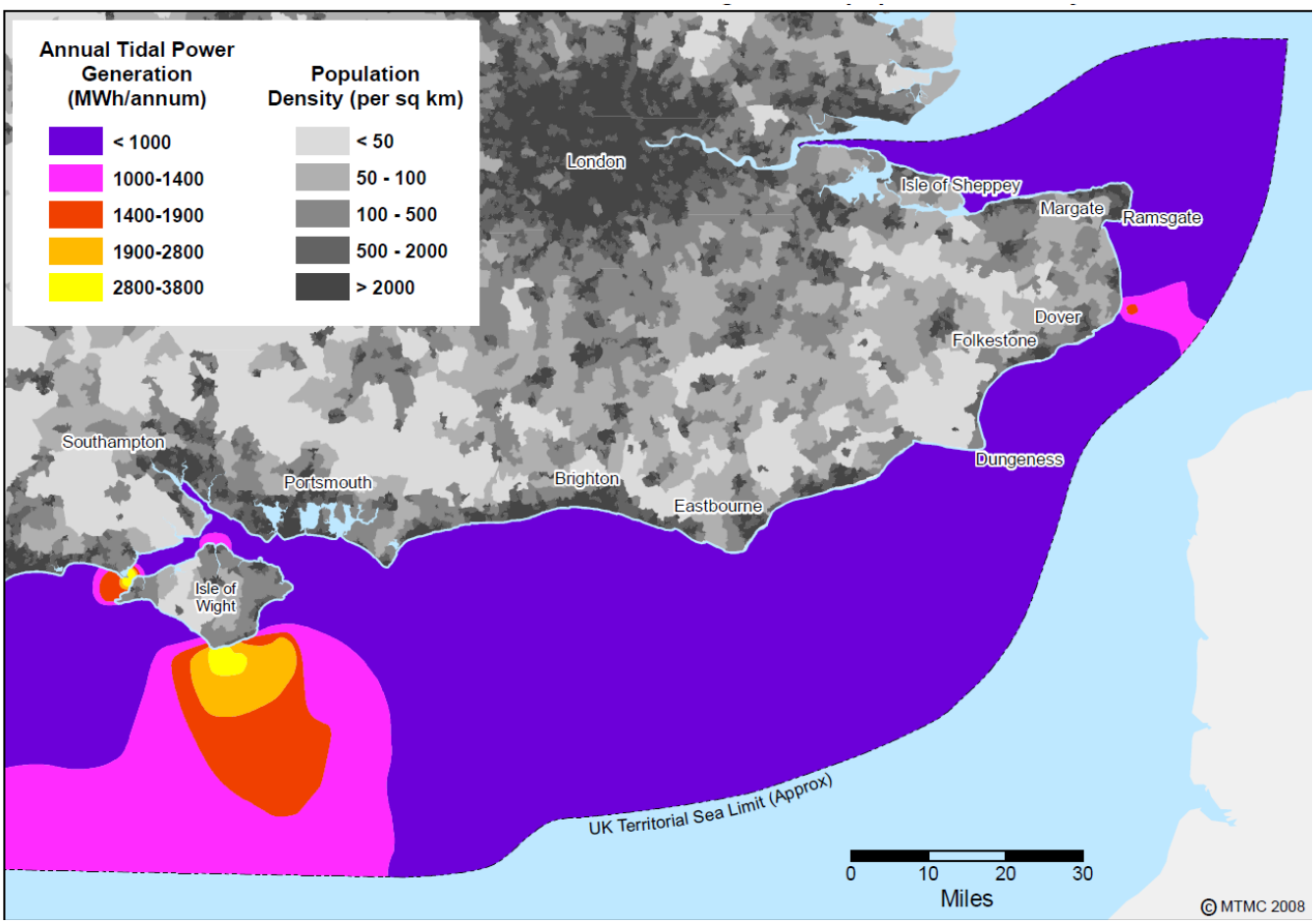
4.18 Whilst the data available was published in 2015 there has been no other sources of information on biomass published for the Fareham/PfSH area. Therefore this is the best available evidence.

Tidal and Wave Energy

4.19 Predictions of the potential to create an energy supply from tidal power are difficult and vary greatly. Research and development in this area is still developing. However, the image below demonstrates the potential annual tidal generation for the South East of England. As shown, the coastline of Fareham has a potential tidal energy generation of less than a 1,000 MWH per annum. Notwithstanding any of the environmental and ecological constraints for Fareham, the predicted energy generation suggest that it would be unviable for tidal generation along Fareham's coastline.[18]

[18] http://www.solentoceanenergy.com/Seeda_final5.pdf

Figure 4: Potential Annual Tidal generation for the South East of England



4.20 In addition, the Fareham coastline is sheltered by the Isle of Wight reducing wave heights rendering renewable energy from wave power also unlikely. In addition, Fareham Borough Council would not be the consenting authority for tidal and wave development. This is because these types of development would be outside of the Borough boundary.

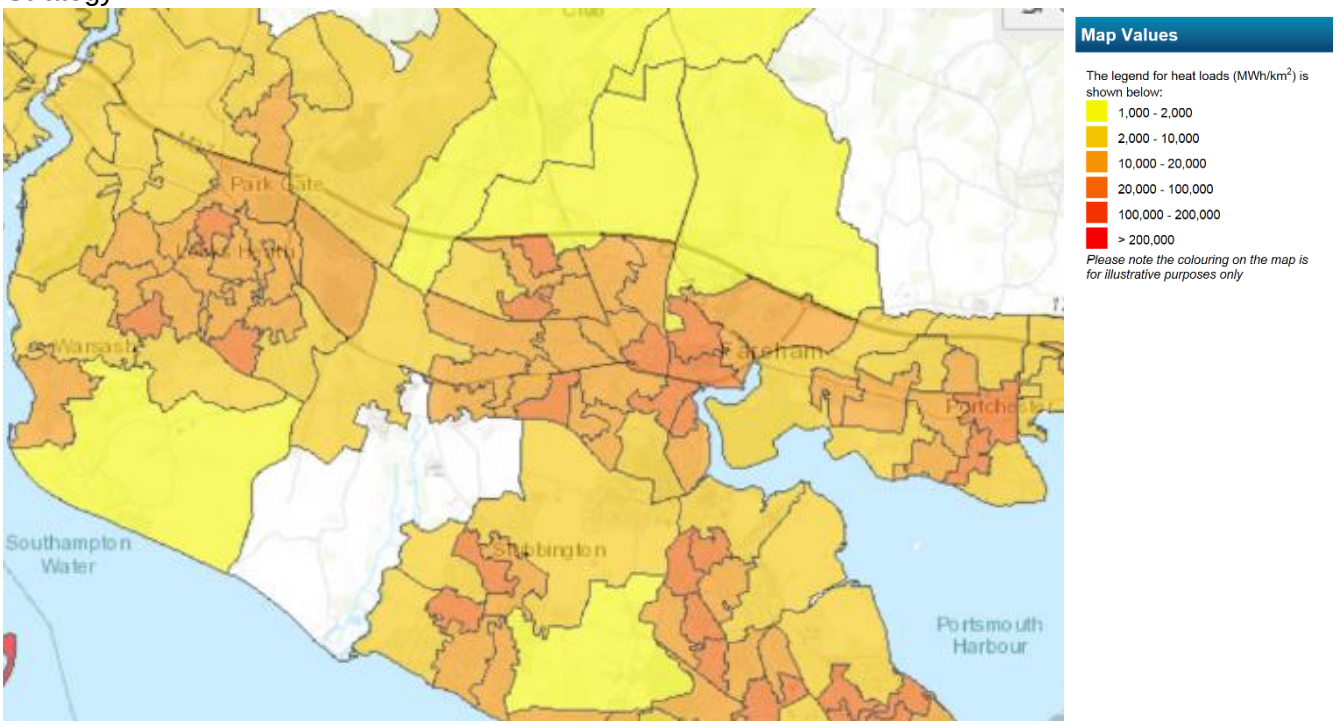
Combined Heat and Power and District Heating

4.21 National Heat Map for the Department for Business, Energy & Industrial Strategy [19] shows heat demand across England at a range of scales from national to local. The heat map is produced from a database of modelled heat demand for every address in the country (and actual heat demand for buildings which have Display Energy Certificates). This enables users to locate and investigate areas of high heat demand which may be suitable for district heating or Combined Heat and Power.

4.22 The purpose of the map is to support planning and development of local low-carbon energy projects in England, by providing publicly accessible high-resolution web-based maps of heat demand by area. The most useful way to visualise heat map data is in the form of a heat demand density layer as shown in the images below. This shows total heat demand per unit of land area in MWh heat / square Kilometre). The darker the areas the higher the density and heat demand. CHP Development Map of Fareham from the Department for Business, Energy & Industrial Strategy

[19] https://chptools.decc.gov.uk/developmentmap

Figure 5: CHP Development Map of Fareham from Department for Business, Energy & Industrial Strategy.



4.23 There are a number of areas in the Borough where the density and heat demand is relatively high. These are particularly found around the town/district centre areas such as in Portchester, Fareham Town, Stubbington and Locks Heath where there are a mix of residential, retail and business uses in a relatively compact area. Other areas in the Borough include where residential housing is much denser compared to the surrounding areas. This would indicate that Combined Heat and Power or District Heating Schemes in areas of Fareham could be a potentially viable option providing the environmental, social and land constraints were adequately taken into account.

4.24 Combined Heat and Power and District Heating schemes can often be powered through a number of technologies or industries that produce excess quantities of heat. For example, they can be a part of a waste incineration scheme, biomass boiler, geothermal or anything where the purpose might be the generation of electricity but the excess heat is produced which can then be utilised by other neighbouring land uses.

Geothermal

4.25 Geothermal energy utilises heat from the earth to create energy through high temperature steam power generation or the lower temperature production of heat.

4.26 There is one identifiable geothermal energy plant in the sub-region operates in Southampton which provides district heating for various house, business, offices and retail outlets in the city centre.

4.27 Identification of such a resource requires a specialist, site specific resource assessment. For example, ground water temperatures need to be in or exceeding 100^0C and at commercially viable volumes. A potentially viable resource could be identified in Fareham using a desk based study approach. However, proving the reliability of such a resource would require considerable expenditure in exploration and with no guaranteed success. The existence of an operational scheme in the region is not a basis on which to assume the existence of a similar resource in Fareham.

4.28 A capacity study has therefore not been carried out for Geothermal heat and power generation in Fareham.

5. Constraints: Environmental

5.1 This section will present the local environmental features and issues which will constrain the development of technologies assessed in this study.

Landscape

5.2 Fareham has landscape areas of the Borough that would be highly sensitive to large scale renewable and low carbon energy. The emerging Local Plan proposes to designate particular locations in the Borough as Areas of Special Landscape Quality (ASLQ). This is in recognition that these areas represent the most valued landscapes in the Borough, and in line with the NPPF, these should be protected and enhanced.

5.3 The policy approach for ASLQs is that development will only be permitted where these landscapes are protected and enhanced.

5.4 In addition to ASLQs, LDA Design produced a detailed Landscape Sensitivity Assessment for the Council in2018. The assessment covered the whole of the Borough and included a detailed analysis of the ability of each of identified landscape areas to accommodate 'development'. The nature of that development is not specifically defined however, the primary purpose of the assessment is to assist the Council in evaluating different development options to meet future housing needs. Therefore, new housing development is the principal type of development envisaged and addressed in the sensitivity assessment. However, the development principles and criteria that arise from the sensitivity assessment are also relevant in testing the suitability of other types and forms of development. The Fareham Landscape Sensitivity Assessment is therefore a critical piece of evidence that would need to be considered in the event of any application for renewable energy development in the Borough.

5.5 At a high level, the Landscape Sensitivity Assessment identified 14 different landscape areas in the Borough. Each have been split up into sub-areas reflecting local landscape variations within those 14 broader areas. The Landscape Sensitivity Assessment then describes the key landscape features of the area and presents an assessment of their sensitivity and capacity to accommodate any future development.

5.6 Renewable energy developments should have regards to the identified sensitive landscape features in the Borough.

Historic Environment

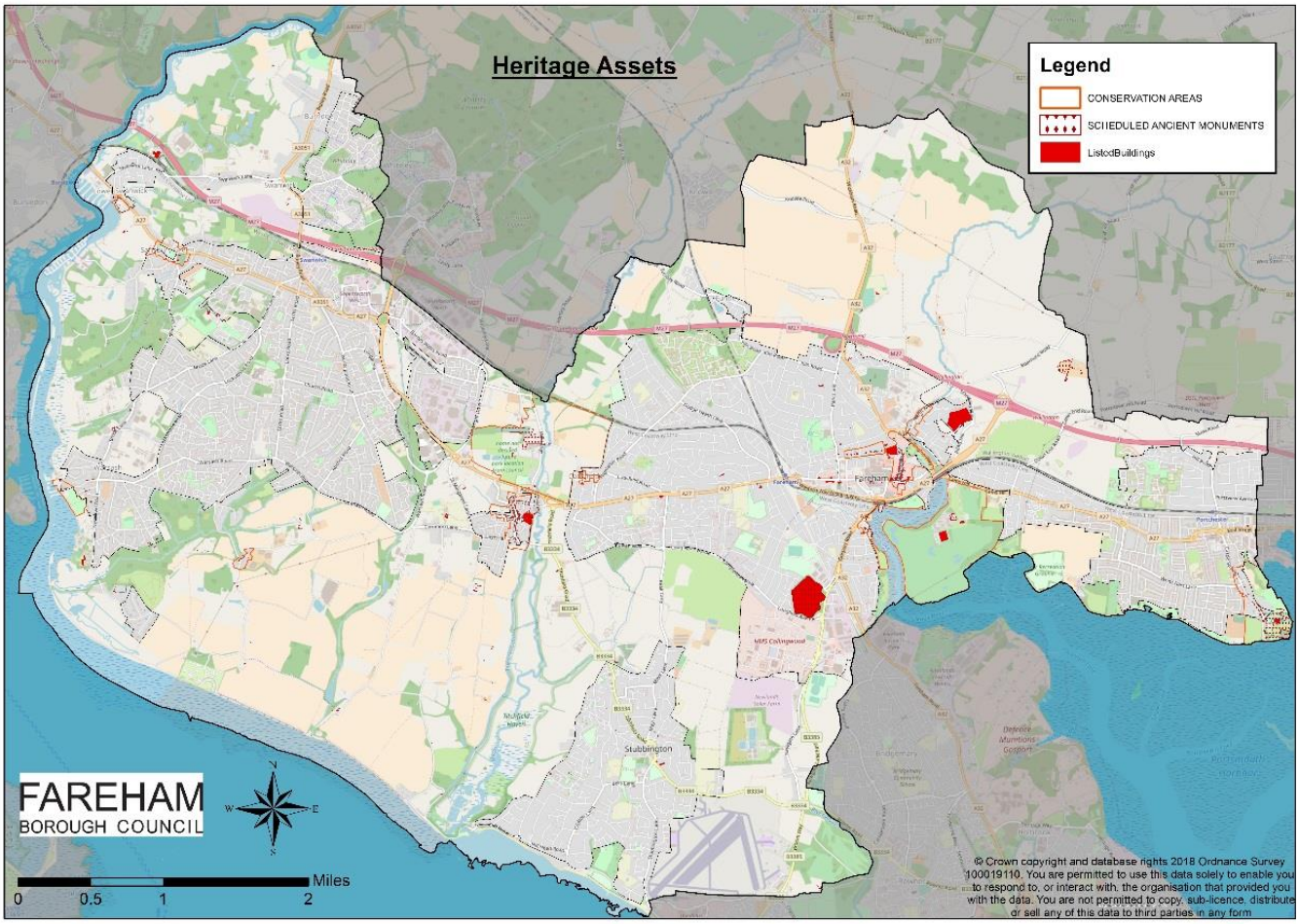
5.7 Renewable energy development in Fareham also has the potential to cause direct harm to the many historic buildings and areas in Fareham or cause indirect harm by impacting on the historic setting of the historic features in the Borough. The Council has a duty in the Planning (listed Buildings and Conservation Areas) Act when considering planning proposals to preserve the character and appearance of a listed building or its setting or any features of special architectural or historic interest.

5.8 There are 2 Schedule Ancient Monuments in the Borough, 4 Grade I listed, 428 Grade II listed and 119 Locally Listed. In addition the Borough has 13 Conservation Areas which include:

- Cams Hall
- Catisfield
- Fareham High Street
- Hook
- Osborn Road
- Portchester, Castle Street
- Sarisbury Green
- Swanwick Shore
- Titchfield
- Titchfield Abbey
- Town Quay
- Wallington
- Warsash

5.9 Different renewable and low carbon energy technologies will have varying degrees of impacts in terms of scale and magnitude on the historic environement. Therefore applications for renewable and low carbon energy development in Fareham should be considered on a case by case basis and are dependent on the type and location.

Figure 6: Desiganted and Undesignated Heritage assets in Fareham Borough



Ecological

5.10 The Hampshire Local Nature Partnership recently produced an ecological network map for the whole of Hampshire. The map indicates 3 biodiversity categories:

- Core Statutory nature designations which includes Special Protection Areas (SPA), Sites of Special Scientific Interest,
- Core non-statutory designations such as Sites of Importance for Nature Conservation and Local Nature Reserves and
- Network Opportunity Areas which are areas of habitat that with suitable enhancement or management, could become important areas for biodiversity like the statutory and non-statutory areas.

5.11 In line with the mitigation hierarchy, impacts from renewable energy sources on the areas identified in the ecological network map should be avoided, mitigated and as a last resort, compensated. In addition, National Planning Policy also requires LPAs to identify and pursue opportunites for securing measurable net gains for biodiversity. Depending on the scale of the development this would mean that applciations for renewable and low carbon energy development would also have to provide measured gains for biodiversity.

5.12 The scale and extent of ecological impact is dependent on the technology planned for a particualr area. For example, windfarm development adjacent to any of the Special Protection Areas in the Solent which are designated for their important bird populations would likely cause significant impacts on the designated site result, due to the risk of bird strikes. As a result, impacts on ecology will be considered on a case by case basis. However, reference to the ecological network map would be a good starting point for applicants particulalry when demonstrating that the mitigation hierarchy has been followed as well as providing net gains for biodiversity.

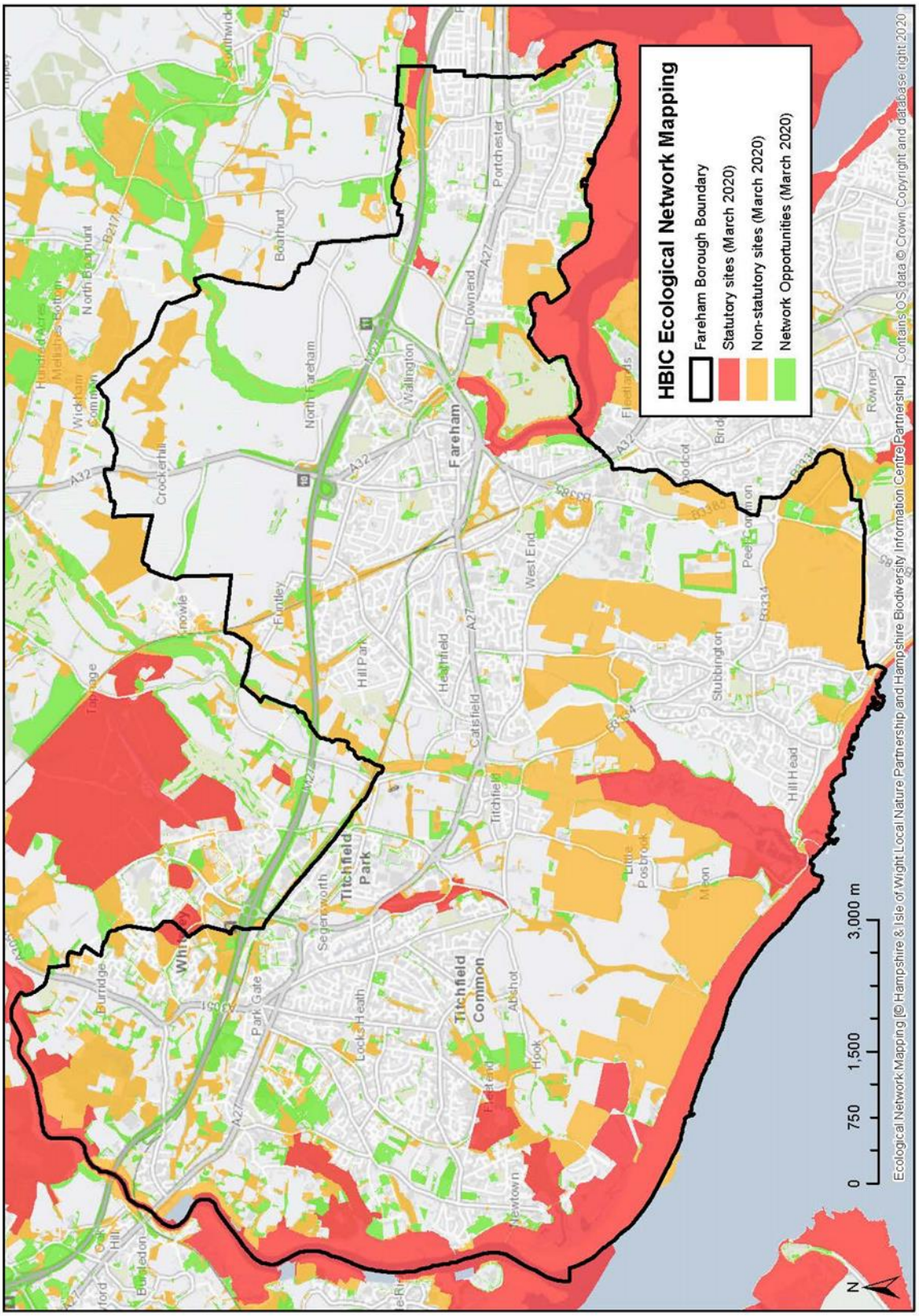
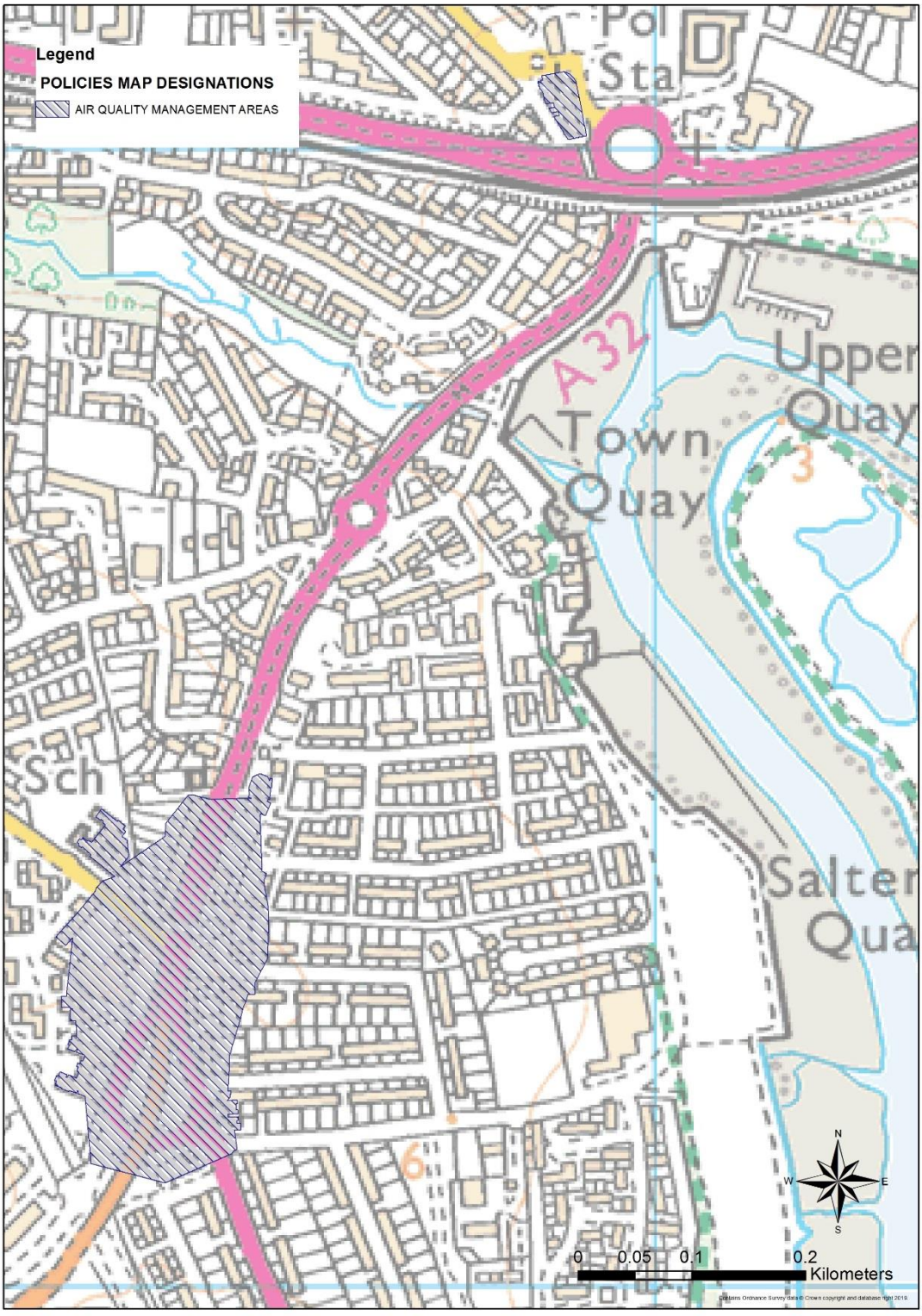


Figure 7: Local Ecological Network Map of Fareham Borough

Air Quality

5.13 There exists two designated Air Quality Management Areas (AQMAs) in Fareham as shown in the figure below.

Figure 8: Air Quality Management Areas in Fareham



5.14 Consideration of the impacts on air quality is required for any type of renewable energy type that may contribute to worsening air quality in the Borough particulalry those areas within an AQMA or the wider sub-region. This would include the incombination air quality effects from other sources. However, it is recognised that there are many forms of renewable energy which are non polluting and would not be detriment to the quality of air within Fareham or the wider area.

Water and Ground Water

5.15 There are three principal rivers that flow through the Borough all of which benefit from protection for their ecological value at all or certain reaches that are within the Borough. The designations are shown on the adopted policies Map and on the Ecological Network Map for Fareham.

5.16 There are also a number of other smaller streams and tributaries in the Borough that are also important for aquatic and marine wildlife. These should be idenitified and impacts on them appropriately avoided in the event of a renewable enrgy proposal being planned in their vacinity.

5.17 The Environment Agency has identified issues associated with varying levels of water quality in the Watercourses/ Transitional and Coastal Water bodies in the Borough, these are presented in table 5 below[20]. As seen the water course and transitional and coastal water bodies in the area show moderate levels of water quality. Renewable Energy developments within the Borough should not contribute to the further decline in status of these water bodies and where appropriate, should contribute towards the Water Framework Objectives to achieve 'good' status of all water bodies in the area.

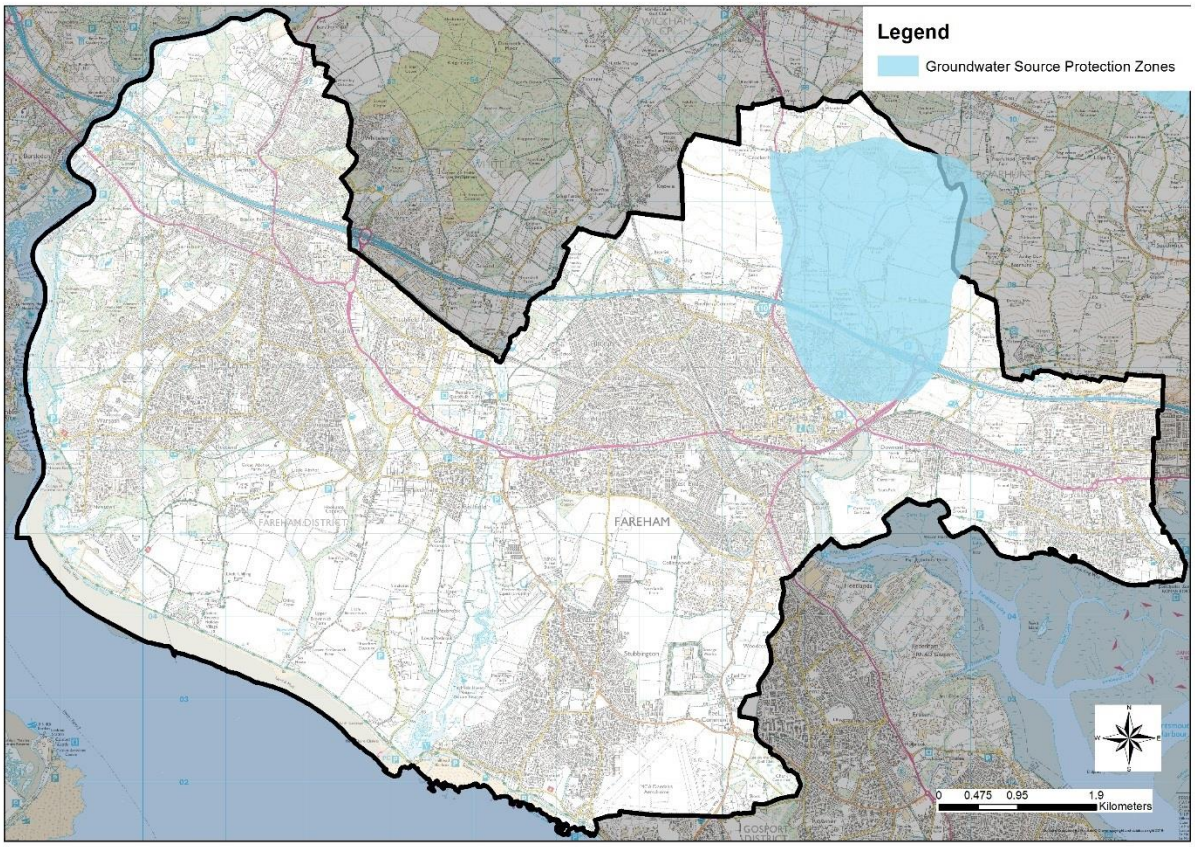
Table 5: Waterbody Status as classified by the Environment Agency

Watercourse/ Transitional and Coastal Water bodies	Overall water body status	Element(s) not achieving good status
Meon	Moderate	Macrophytes and Phytobenthos Combined
Wallington	Moderate	Hydrological Regime Phosphate
Upper Hamble	Moderate	Hydrological Regime Phosphate
Southampton Water	Moderate	Dissolved Inorganic Nitrogen Mitigation Measures Assessment Tributyltin Compounds
The Solent	Moderate	Angiosperms, Dissolved Inorganic Nitrogen Mitigation Measures Assessment Tributyltin Compounds
Portsmouth Harbour	Moderate	Macroalgae Angiosperms, Dissolved Inorganic Nitrogen

[20] https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3157

5.18 There is one Source Protection Zone in the Borough as identified below. Contamination, disruption or any other identified impact on this zone by any form of renewable energy should be avoided.

Figure 9: Groundwater Source Protection Zone



5.19 The PUSH Integrated Water Management Study assessed amongst other things the impacts of development upon water resources within the PUSH Region. The study identified that out of the two main water supply companies, Portsmouth Water indicated that they will be in surplus by 2040 even after accounting for growth of up to 68,000 homes. However Southern Water indicated that out of the 4 main Water Resource Zones (WRZs) 3 will be in deficit (Hampshire South WRZ, Isle of Wight WRZ and Hampshire Kingsclere), the fourth (Hampshire Andover) will not be in deficit. Both companies have put forward a range of options in their respective Water Resources Management Plans to ensure resiliance or in the case of Souther Water, increase their supply of water to meet forecasted demand.

5.20 Renewable and low carbon energy development will need to ensure that is does not impact upon the demand and availability of water particularly within the WRZs that are identified as being in deficit within Southern Water's region. Proposals that may cause any hydrological changes to water bodies should first consult the Environment Agency and the stututory water providers to ensure their effects are adequately mitigated.

Future and Current Flood Risk (Climate Change)

5.21 Renewable and low carbon energy development would need to be resilient to the current and future threats of climate change. In particular there are areas of the Borough that are at risk of flooding from fluvial and tidal sources both now and in future. Renewable and low carbon energy development would need to avoid these areas to ensure that there are no avoidable

accidents, threats to life and that the development can remain safe over the course of its lifetime.

Figure 10: Current Flood Zones produced by the Environment Agency

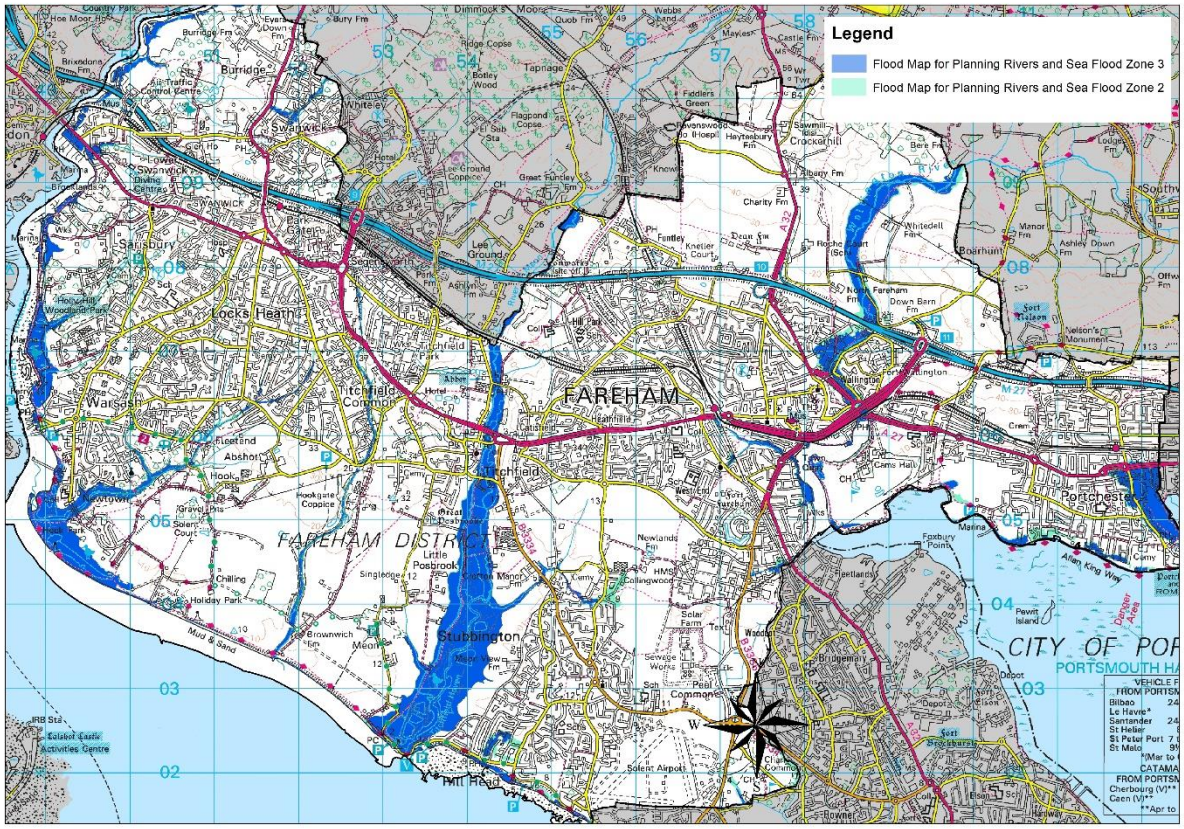
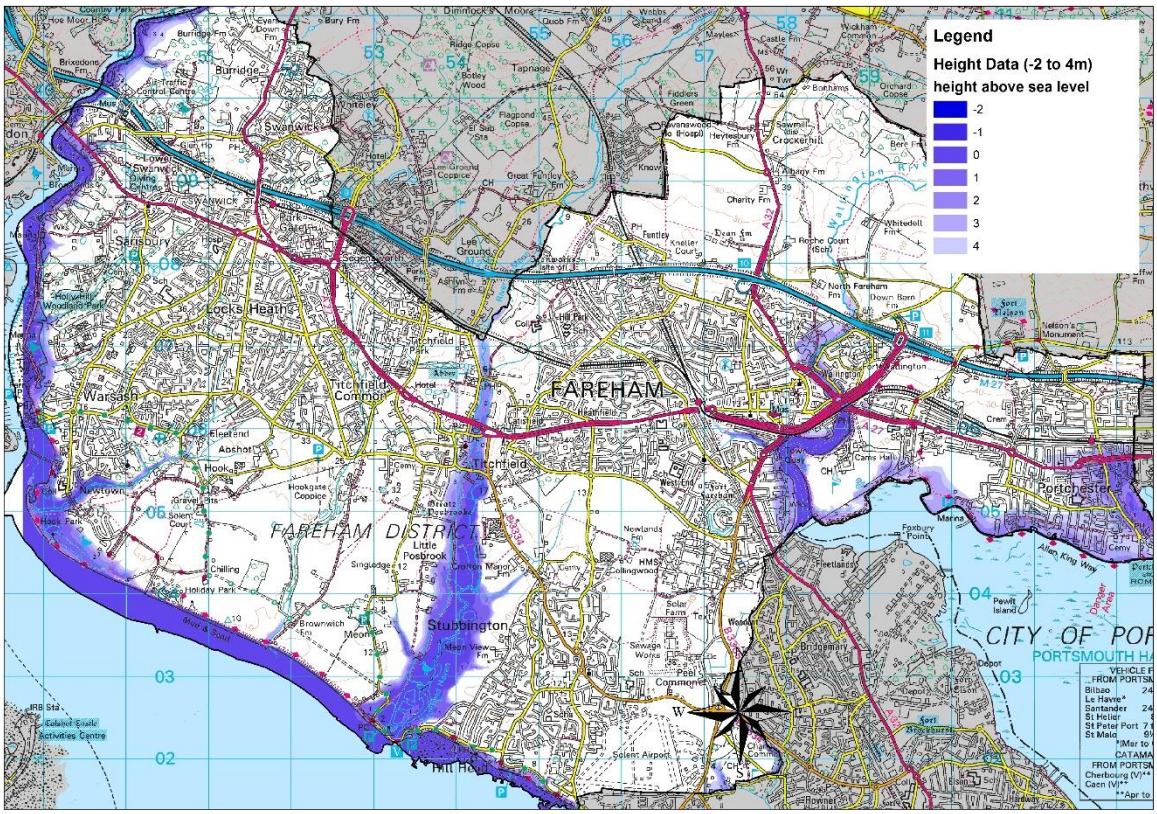


Figure 11: showing areas of the Borough that could potentially be at risk of flooding as a result of climate change.



6. Technology Capacity Assessment

6.1 This section utilises the environmental constraints listed in the section above alongside the specifics of each renewable and low carbon energy technology looked at to present a picture of the suitability and capacity for them in Fareham.

Solar and Wind

6.2 Due to the location of the Borough in the south of the United Kingdom, Fareham offers a good location for solar PV and Wind development. The maps on pages 33 and 34, demonstrate the areas of the Borough which would have the least constraints for solar and wind development. The major inhibitors to these types of development: ecological designations, residential properties and built form have been identified and used to highlight areas left over that would be least constrained for solar and wind development . The key datasets used in this task were:

- International and National ecologicsal desigantions (SPA, SAC, SSSI, LNR)
- Local Nature Reserves and Sites of Importance for Nature Conservation.
- Solent Wader and Brent Geese Network.
- Conservation Areas
- Areas of Special Landscape Quality[21]
- Open Space and Local Greenspace
- Exisiting development and proposed development with a buffer zone of 50m for solar development and a buffer zone of 300m, 400m and 500m for wind energy.
- Roads with a buffer of 50m
- Transmission Lines with a buffer of 100m for saftey
- Flood Zones
- Future Development Allocations

6.3 The NPPG states that local planning authorities should not rule out otherwise acceptable renewable energy developments through inflexible rules on buffer zones or separation distances. Other than when dealing with set-back distances for safety, distance itself does not necessarily determine whether the impact of a proposal is unacceptable.

6.4 A 50m buffer from solar development to roads and existing developments was used as an approximate distance to limit any effects (such as reflection of light) on these neighbouring land uses.

6.5 For Wind development, all properties (including those within the emerging local plan as allocations) in Fareham Borough were buffered by three distances- 300m, 400m and 500m+. These buffer distances have been chosen to represent noise ranges for the different scales of wind energy developments that could be proposed in the area.

6.6 However, in recognition of the NPPG, flexibility should be employed in buffering distances, allowing applications for solar development in particular to be situated closer to road and residential settlements if justified and appropriately mitigated.

[21] As defined in the emerging Local Plan

Figure 12: Areas Least constraint for Solar Energy

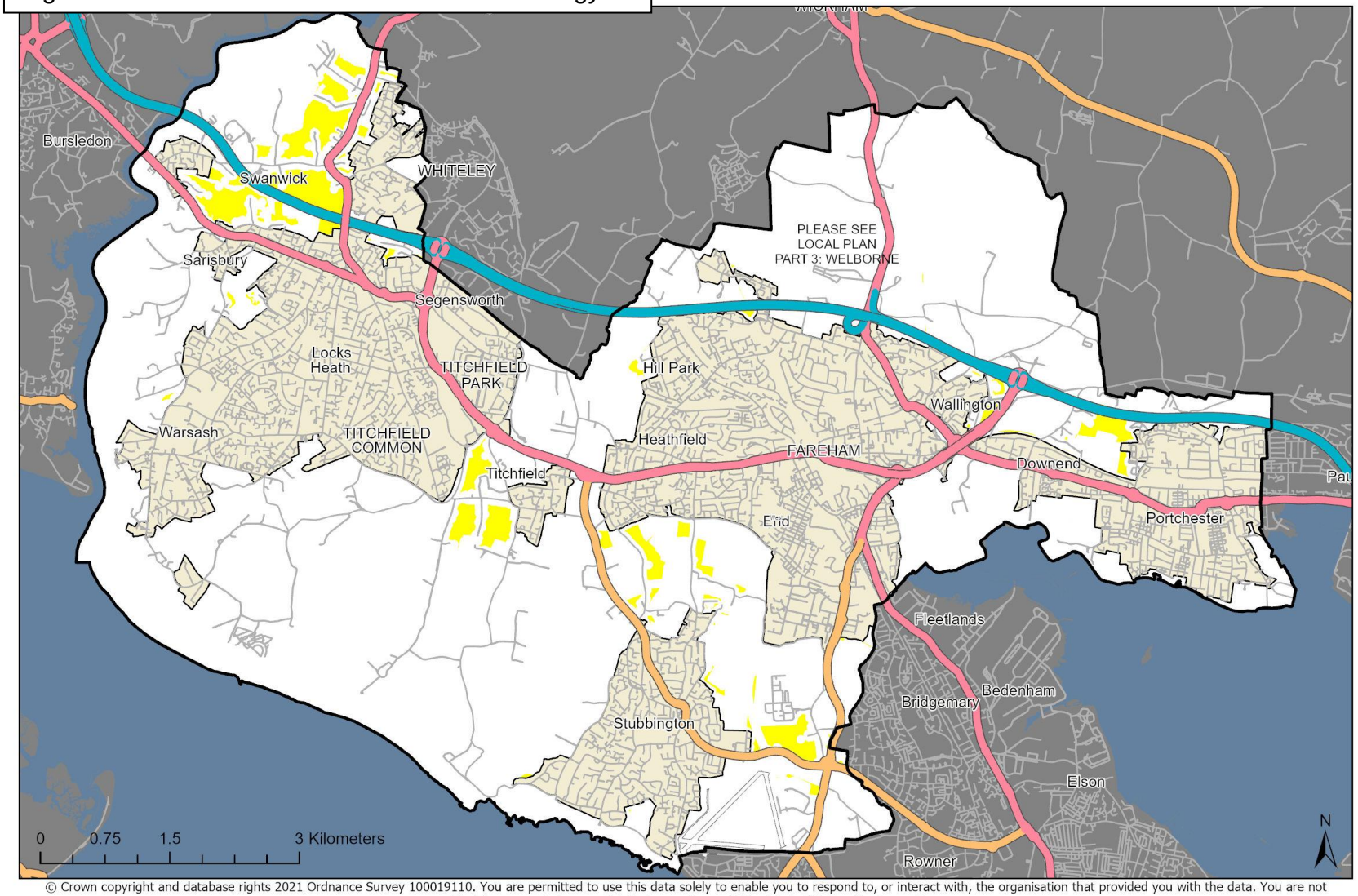
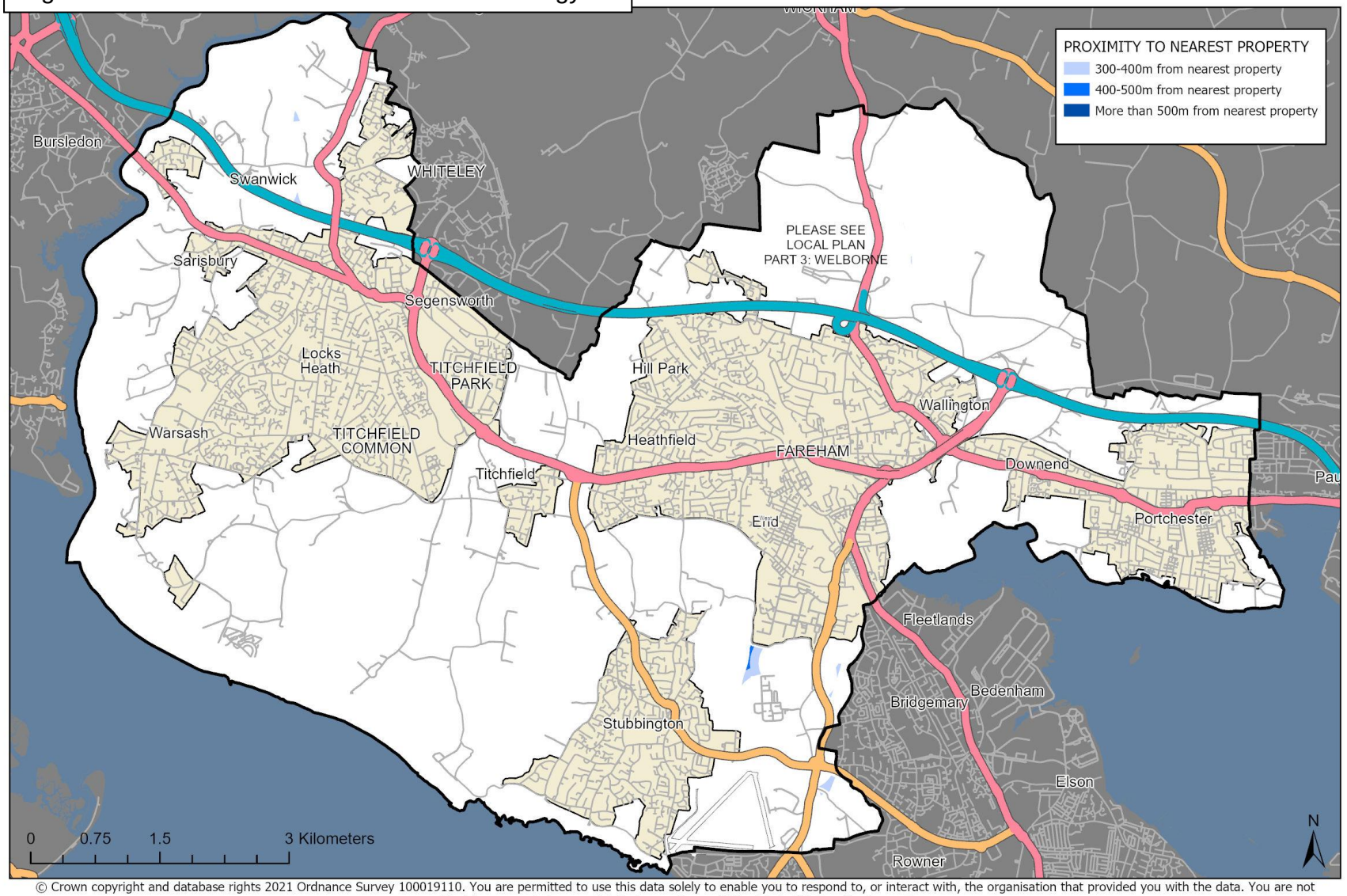


Figure 13: Areas Least constraint for Wind Energy



6.7 As shown there are some areas of least constraint in the Borough for solar energy production. However, when taking into account the various environmental and landscape constraints across the Borough, there appears to be almost no areas that are least constraint for wind energy production. Therefore, whilst there is suitable wind resource for wind energy development, the technology is deemed not feasible in the Borough due to the amount of contraints that exist. It is for these reasons why the Local Plan 2037 referes to solar energy development only and not wind energy potential in the Borough.

6.8 The areas defined as 'least constraint' for solar energy on the above map are, as the name suggests, not completely free of constraints and therefore it will be necessary for applicants to still assess and mitigate any identified impacts associated with their development.

Such impacts that are likely to be required to be assessed and therefore mitigated include:

- Landscape and visual impacts (including reflection for solar pannels and development impacts on the setting of historical features and assets)
- Ecological Impacts (loss of priority and protected species and habitats onsite or close by)
- Noise either during construction, operation or decomissioning
- Traffic either during construction, operation or decomissioning

6.9 In addition, the proximity of Fareham to Southampton and Solent (Daedalus) Airports (a 30km consultation buffer zone implemented for safeguarding reasons) means it is recommended that any developers proposing solar energy developments within the Fareham Borough consult with Southampton and Solent Airport prior to submitting an application. The Council will consult where appropriate, with both airport authorities on renewable and low carbon energy development planning applications received.

6.10 It may be that areas identified outside of 'least constrained' could be suitable for the right scale and size of project. Justification for a project located outside of the 'least constrained' area should be given in the supporting information of a planning application.

Hydroelectric power

6.11 The River Hamble is a major watercourse which forms western boundary of the Borough. The river is constrained both environmentally through various international and national desigantion (SPA, SAC, Ramsar, SSSI and LNR) and through being used as a navigable river for boats and other craft.

6.12 The River Wallington flows through the Borough just east of the main town of Fareham. Parts of the Wallington are also designated as Sites for Importance for Nature Conservation (SINC).

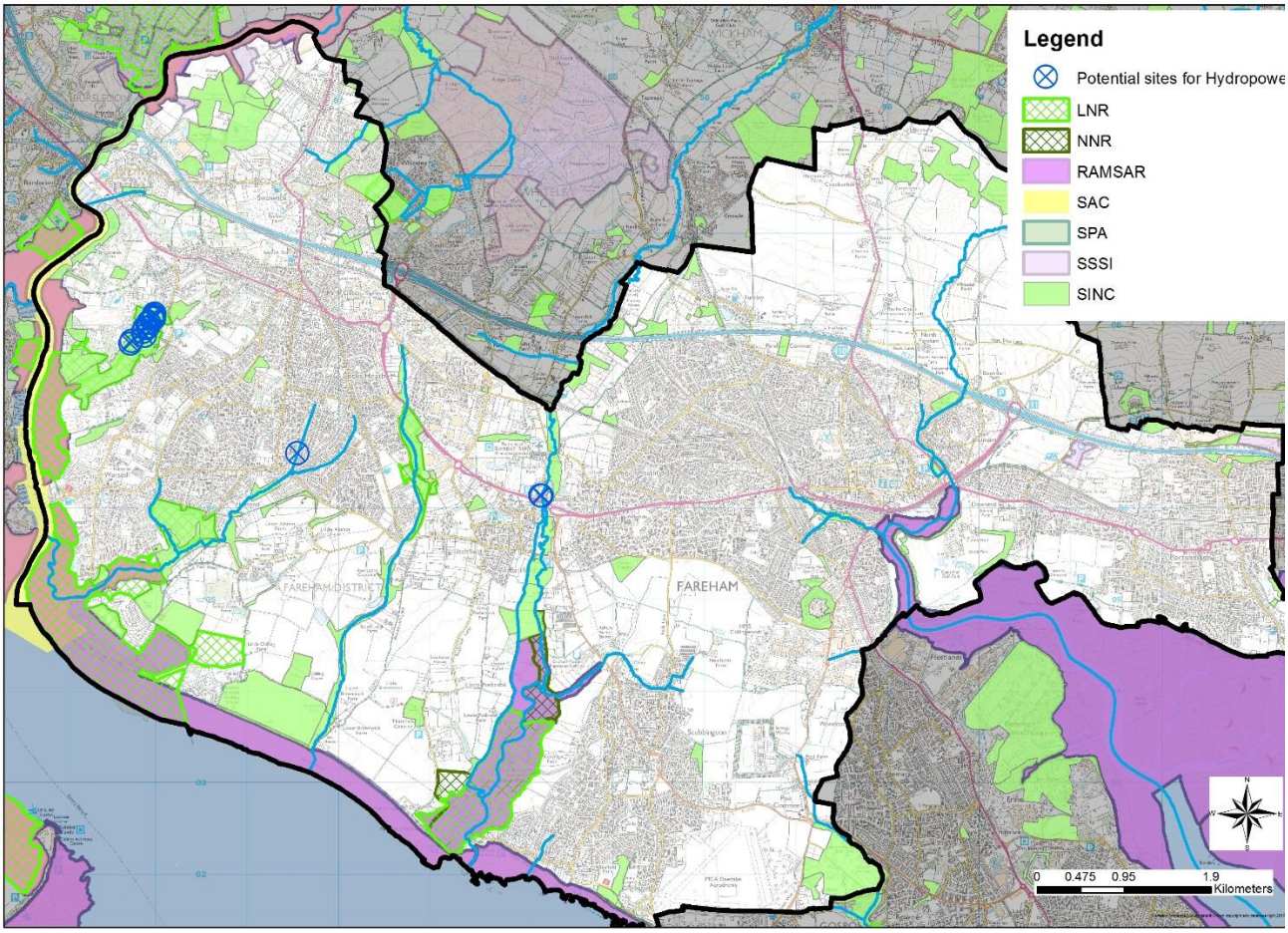
6.13 The River Meon flows through the central part of the Borough. The river is considered an important chalk stream constrained primarily through environmental designations and protected species that inhabit the river and the riparian zone. The mouth of the river is designated as a SPA, SSSI and Ramsar site. Whilst to the north of the SPA and SSSI designations there is a SINC designation.

6.14 Small scale hydroelectric schemes generally have a low environmental impact with the primary concern being the impact on migratory fish populations. This impact however, occurs irrespective of the scale of Run of River (ROR) schemes and suitable mitigation would be required in the event of any hydropower scheme coming forward. The River

Meon contains a variety of fish species notably Sea Trout, eels, lamprey which are UK BAP priority fish species. There are also records of chub, grayling and occasionally wild salmon. There are also plans being drawn up to introduce compensatory measures for wild salmon in the river Meon to off-set the impacts on this species in nearby rivers as a result of water abstraction licences.

6.15 For all rivers there is the potential physical impacts of hydro-schemes on river flow and discharge which can alter the morphology of the river casuing flooding and erosion both up and downstream from the source of the hydroelectric scheme[22]. All rivers in Fareham flow into the Solent which is internationally protected for its habitats and species. Changes in hydrological regimes of these rivers could result in impacts on the integrity of the designated feautres in the Solent and would first need to be investigated.

Figure 14: Potential Sites for Hydropower identified by the Environment Agency overlaid with Environmental designations.

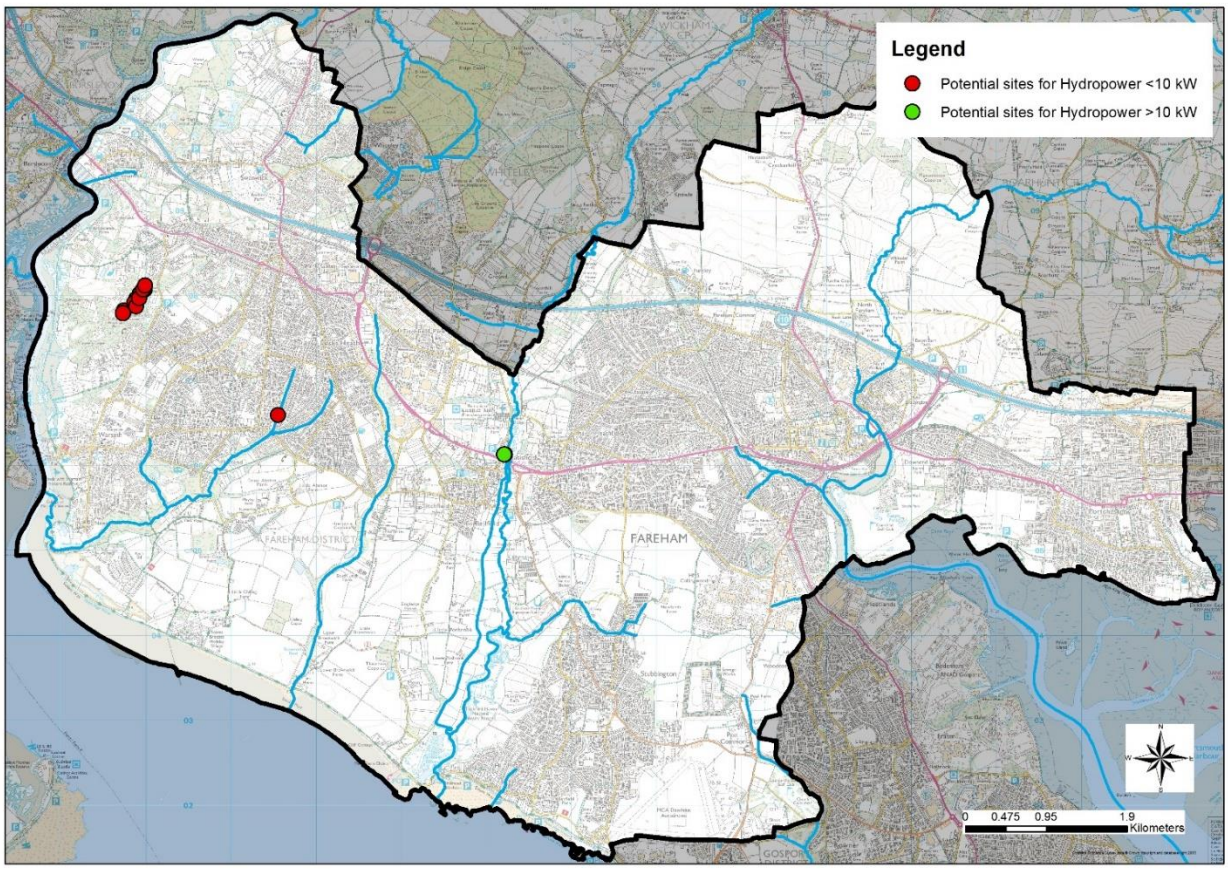


6.16 There are a total of 3 locations in the Borough which the Environment Agency have identified as having the potential for hydroelectric power. Sites capable of producing 0-10kW are not considered to attract an economic return on investment in order to be feasible. They can therefore be discounted from the capacity assessment. This means the locations idenitified in Holly Hill local Nature Reserve and in Locks Heath are discounted from the capacity assessment because the potenial power generation is within the 0-10 kW

[22] Anderson, D., Moggridge H., Warren, P. and Shucksmith, J. 2014. The impacts of 'run of river' hydropower on the physical and ecological condition of rivers. 29 (2), 268-276 https://onlinelibrary.wiley.com/doi/full/10.1111/wej.12101

threshold. However, the two sites located on the River Meon have generation capacity of around 10-12 kW and so are considered feasible as they could attract a high enough economic return on any investment.

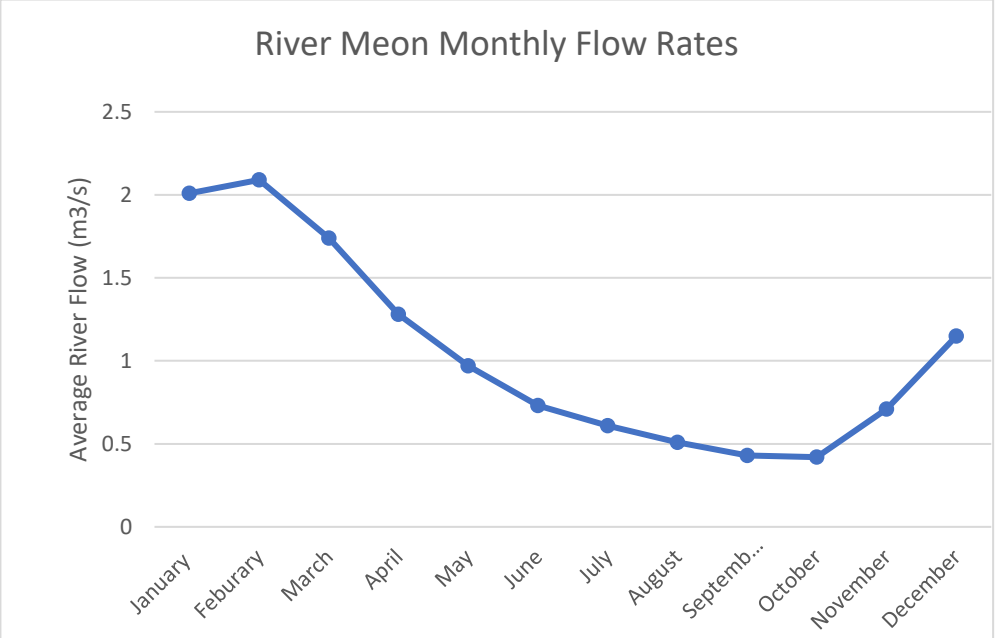
Figure 15: Potential sites for Hydropower and Energy Generation Potential.



6.17 Notwithstanding the ecological constraints on the river Meon, the nature of RoR schemes recommended would be without storage and would therefore be subject to seasonal variations in flowrate.

6.18 Monthly flow data from the last 10 years for the River Meon was obtained from the National Flow Archive from the measuring station at Mislingford.

Figure 16: River Meon Monthly Flow Rates from the measuring station at Mislingford



6.19 Expected power and energy outputs for a hydropower station based on the monthy average flow rates on the River Meon at the Titchfield Water Mill, are shown in table 6 below.

Table 6

Titchfield Mill – potential power output 10.5 kW	Av. Flowrate	Expected Power Output	Expected Energy Output
	m^3/s	kW	kWh
Peak (Dec-May)	1.54	16.17	70,630.56
Low (June-Nov	0.57	5.99	26,308.08
		Total Energy/Year	96,938.64

6.20 Expected power and energy outputs for a hydropower station based on the monthy average flow rates on the River Meon at the adjacent sluice by the Titchfield Water Mill, are shown in table 7 below.

Table 7

Titchfield Mill Sluice– potential power output 12 kW	Av. Flowrate	Expected Power Output	Expected Energy Output
	m^3/s	kW	kWh
Peak (Dec-May)	1.54	18.48	80,720.64
Low (June-Nov	0.57	6.84	30,041.28
		Total Energy/Year	110,761.92

Biomass and Anaerobic

6.21 As shown from the data at the PfSH scale, there is potential for some biomass development in the Borough. However, any proposals would need to have regard to the environmental constraints within the Borough in particular the landscape and the incombination effects on air quality. Areas of the Borough suitable for a large biomass plant will be limited due to the sensitivity of the landscape and the usual size of a biomass plant. Proposals would need to

have regard to the Council's Landscape Sensitivity Assessment (2018) to ensure that biomass development was located in a less sensitive landscape area. The Council would expect a thorough and detailed assessment of the impact of the development on the amenity of nearby resident and business. Appropriate mitigation would also be required where impacts from noise and odur occur and if there were impacts on the two AQMA designations.

Tidal and Wave Energy

6.22 As shown, the potential for tidal generation is relatively low for Fareham's coastline (less than 1,000 MWH per annum). The same applies for wave energy generation because the coastline around Fareham is sheltered from large waves by the Isle of Wight. Any proposals would need to undertake more detailed analysis and assessment of the potential viability for this form of energy generation. Proposals would need to take into account the many protected species and ecological designations present in the Solent area (SPAs, SACs and Ramsar sites) as well as the constraints associated with shipping activities. Consultation with organisations such as Natural England and the Marine Management Organisation would be required if any proposals did come forward.

Combined Heat and Power and District Heating

6.23 The denser town/district centre areas of Fareham such as in Portchester, Fareham Town, Locks Heath and Stubbington where there are a mix of residential, retail and business uses in a compact area offer the greatest opportunities for CHP and District Heating. This is because there needs to be sufficient surplus heat produced by nearby industries along with a sufficient supply of residential, commercial and other occupiers nearby to make use of the spare heat capacity.

6.24 Future redevelopment and regeneration of these town and local centres could include schemes for CHP/District Heating particularly those schemes promoting high-density development. The same principle applies for new high-density development outside of the town and local centres. However, any applicant would need to investigate this further to ensure it was viable.

6.25 The technology is clearly best suited in an urban environment therefore any proposals within existing urban areas should have regard to the setting any of the Conservation Areas or listed buildings and heritage assets in the Borough. Furthermore, impacts and effects from combustion dispersal, noise, visual impact and storage of fuels on neighbouring residents businesses would need to be carefully assessed and where appropriate, mitigated. This would also apply when integrated within proposed greenfield urban extensions.

7. Local Plan Policy Recommendations

Choice of Renewable and Low Carbon Energy

7.1 This study has shown that of the technologies assessed there are some more suitable and favourable forms of renewable and low carbon energy technologies for Fareham Borough. These are highlighted below:

- Solar
- Combined Heat and Power
- District Heating

7.2 Some forms of renewable and low carbon energy technologies included in this study (such as thoses listed below) have potential to be suitable in the Borough. However they need further detailed investigation and consideration, particularly around the specific constraints identified with each technology and/or the wider environment.

- Hydroelectric Power
- Biomass

7.3 The study also shows that there is suitable wind resource available to make wind power a viable energy source. However amount of environmental constraints and considerations in the Borough, in addition to the current government's policy position on onshore wind turbines, means that large scale wind energy development in Fareham is at present not appropriate and achieveable.Therefore, it is discounted as possible renewable energy technology for the Borough.

7.4 Due to the amount of environmental and other contraints as well as the lack of resource potential, Tidal and Wave energy is considered to not be viable in Fareham.

Policy Recommendations for Fareham Local Plan 2037

7.5 It is evident that there is and will continue to be sufficient demand and interest for renewable and low carbon energy development within Fareham. With the Government's target to achieve net zero emissions by 2050 legally binding, the demand for energy coming from renewable or low carbon sources is expected to increase. It is therefore important that the Council has a policy in place within its emerging Local Plan to control and guide future renewable and low carbon energy development in the Borough.

7.6 Because of the variety of renewable and low carbon techologies that could be considered for the Borough, it is recommended that a generalised criteria based policy relating to the major constraints that exist in the Borough should be employed. Renewable and low carbon energy development in Fareham should only be permitted where the adverse impacts on those listed below are identified and can be avoided, adequately mitigated or as a last resort, compensated.

- The character and sensitivity of the surrounding landscape and designated landscape features
- Designated and undesignated heritage assets
- Ecology (deisgnated sites, prioity speices and habitats, ancient woodland and veteran trees.)
- Water quality and resources
- Traffic impacts (from contruction, operation and decommissioning)
- Impacts to surrounding residents and businesses (such as air quality, visual impacts, shadow flicker, waste, odour and noise)

7.7

The NPPF makes clear that applicants are not required to demonstrate overall need for renewable or low carbon energy. Therefore subject to the idenitified impacts being appropriately and adequately addressed applictions should be approved. Applications requiring mitigation should also be accommpanied by a costed management and maintenance plan.

7.8 As solar energy is the most viable and easily identifiable energy source in the Borough. The map produced with this study showing areas of least constraint for solar energy is referred to in the plan to direct solar energy schemes to these particular areas. Because wind energy is not

appropriate for the Borough it should not be included within the Local Plan as a viable renewable energy resource.

7.9 Policy CC4 regarding renewable and low carbon energy will also need to ensure that once a particular site has reached the end of it working life, it is appropriately restored back to its original state or reinstated to a further benefical use.

Below is the Policy which will be in the Local Plan 2037

Policy CC4: Renewable and Low Carbon Energy

Proposals for the delivery of renewable and low carbon energy (excluding wind turbines proposals) and the associated infrastructure will be supported provided that the there are no adverse impacts on:

- *g) The character and sensitivity of the surrounding landscape and designated landscape features; and*
- *h) Designated and undesignated heritage assets; and*
- *i) Ecology, including designated biodiversity and geodiversity sites, priority habitat and species and ancient woodland (including veteran trees) and the flight paths of birds and bats (where appropriate); and*
- *j) Water quality and water resources (including groundwater)*
- *k) The surroundings (including air quality, shadow flicker, waste, odour and noise) of local residents and businesses; and*
- *l) Traffic arising from the construction, decommissioning and maintenance of the infrastructure and/or, where appropriate, the transportation of fuel.*

Proposals for renewable and low carbon energy requiring mitigation for any identified adverse impacts will need to be accompanied by a fully costed management and maintenance plan for the lifetime of the development.

Proposals will only be supported where the benefit of the development clearly outweighs the harm caused by the development

All proposals should, where possible, be resilient and ensure they are safe from future impacts as a result of climate change by avoiding areas of flood risk both now and in the future.
Proposals for solar energy development should have due regard to the areas identified as being least constrained, as shown on the map in Appendix B. Proposals outside of these areas will be required to provide suitable justification to demonstrate their suitability.

Proposals shall demonstrate that the site will be reinstated to an acceptable use appropriate for the area should the development cease to be operational.

8. Further Guidance and Reading

8.1 This study provides a assessment of the potential for a variety of different renewable and low carbon energy technologies. In order to fully determine the potential for each technology in Fareham, it would be necessary to undertake a specific feasibility studies which would take into account all the constraints and determine how suitable the technology was in Fareham.. The following are useful links to more information for Local Authority Case Officers, Developers and interested parties on the types of renewable and low carbon energy technologies covered in this study.

8.2 The National Planning Practice Guidance offers advice on renewable and low carbon energy development including identifying the key constraints and requirements of the main energy sources.

https://www.gov.uk/guidance/renewable-and-low-carbon-energy#active-solar-technology

Solar

8.3

The Energy Saving Trust for smaller residential solar panels
https://energysavingtrust.org.uk/renewable-energy/electricity/solar-panels

Wind

8.4 Natural England and Defra- Wild Birds:Surveys and Monitoring for onshore windfarms.
https://www.gov.uk/guidance/wild-birds-surveys-and-monitoring-for-onshore-wind-farms

Hydro-electric

8.5 Environment Agency. Guidance for Run-of-River Hydropower Development:
https://ifm.org.uk/wp-content/uploads/2017/01/Guidance-for-run-of-river-hydropower-development-LIT4122-747_12-version-5-May-2016.pdf

European Commission Guidance on the Requirements for Hydropower in relation to Natura 2000 Sites
https://ec.europa.eu/environment/nature/natura2000/management/docs/Hydro%20final%20May%202018.final.pdf

Biomass

8.6 Environmental Protection UK. 2009. Biomass and Air Quality Guidance for Local Authorities (England and Wales). Whilst primarily aimed at Local Authorities it is considered useful for developers and members of the public wishing to understand more about this type of technology.

https://www.environmental-protection.org.uk/wp-content/uploads/2013/07/Biomass_and_Air_Quality_Guidance.pdf

Combined Heat and Power/ District Heating

8.7 Department of Energy & Climate Change. 2008. CHP - Environmental, A detailed guide for CHP developers

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/345173/Part_3_CHP_Environmental.pdf

European Union Guidance and case studies on District Heating sytems.

https://guidetodistrictheating.eu/guidance-for-cities-and-towns/